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National Iranian Gas Co.

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Research and Technology Management

امور تدوین استانداردها

Standardization Division

IGS

Iranian Gas Standards

Specification for :

مشخصات فنی :

GAS PRESSURE REGULATORS,DOMESTIC

رگولاتور گاز ازنوع خانگی

APPROVED

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FOREWORD

This standard is intended to be mainly used by **NIGC** and contractors and has been prepared on interpretation of recognized standards , technical documents , knowledge ,backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Standards (**IGS**) are prepared , reviewed and ammended by technical standard committees within NIGC Standardization Div. and submitted to the **NIGC**'s "**STANDARDS COUNCIL**" for approval .

IGS Standards are subject to revision , amendment or withdrawal , if required , thus the latest edition of **IGS** shall be checked/inquired by **NIGC** users .

This standard must not be modified or altered by the end users within **NIGC** and her contractors. Any deviation from normative references and/or well known manufacturers specifications must be reported to Standardization div.

Any comments from concerned parties on **NIGC** distributed **IGS** are welcome to technical standards committees and will receive serious attention and consideration should a revision to standards is recommended .

GENERAL DEFINITIONS :

Throughout this standard the following definitions , where applicable , should be followed :

1- "**STANDARDIZATION DIV.**" has been organized to deal with all aspects of industrial standards in NIGC . Therefore , all queries for clarification or amendments are requested to be directed to the mentioned div.

2- "**COMPANY** " : refers to national iranian gas company .

3- "**SUPLIER**" : refers to a firm who will supply the service , equipment or material to igs specification whether as the prime producer or manufacturer or a trading firm .

4-"**SHALL**" : is used where a provision is mandatory.

5-"**SHOULD**" : is used where a provision is advised only.

6-"**MAY**" : is used where a provision is completely discretionary.

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پیشگفتار

۱- این استاندارد/دستورالعمل بمنظور استفاده اختصاصی در شرکت ملّی گاز ایران و شرکتهای فرعی وابسته تهیه شده است.

۲- شرکت ملّی گاز ایران در مورد نیازهای عمومی از استانداردهای وزارت نفت (IPS)و در موردنیازهای اختصاصی از استانداردهای اختصاصی خود(IGS) استفاده می نماید.

۳- استانداردهای شرکت ملّی گازایران (IGS) توسط کمیته های تخصصی استاندارد متشکل از کارشناسان بخش های مختلف و یا مشاور تهیه می شود و توسط شورای استاندارد (منتخب هیئت مدیره شرکت ملی گازایران) به تصویب میرسند.

۴- در تنظیم متن استانداردهای(IGS) از کلیه منابع شناخته شده استانداردی، اطلاعات فنی- تخصصی مربوط به صنایع گاز دنیا،مشخصات فنی تولیدات سازندگان معتبرجهانی ونیزاز نتیجه تحقیقات و تجربیات کارشناسان ومتخصصان داخلی بر حسب مورد استفاده می شود. همچنین بمنظوراستفاده هرچه بیشترازتولیدات داخلی قابلیت های سازندگان داخلی نیزمورد توجه قرارمیگیرد.

۵- استانداردها از طریق پایگاه اینترنتی شرکت*ویالوح فشرده (CD) در اختیار واحدها و کاربران قرار می گیرد .

۶- استانداردها بطور متوسط هر ۵ سال یکبار و یادرصورت ضرورت زودتر،مورد بازنگری وبروزرسانی قرار میگیرند. بنابراین کاربران باید همیشه آخرین نگارش را مورد استفاده قرار دهند.

۷- هرگونه نظر و یا پیشنهاد اصلاح در مورد استانداردها مورداستقبال وبررسی قرار خواهد گرفت و در صورت تأئید، استانداردمربوطه نیزموردتجدیدنظرقرارخواهدگرفت .

تعاریف عمومی

درمتن استانداردهای (IGS)ازتعاریف واصطلاحات زیراستفاده مشود.

۱- "شرکت"(COMPANY): منظورازشرکت "شرکت ملی گازایران"ویاشرکتهای فرعی وابسته میباشد.

۲- "فروشنده"(SUPPLIER/VENDOR): به فردیاموسسه ای اطلاق میگرددکه تعهدی رانسبت به شرکت تقبل نموده است.

۳- "خریدار"(PURCHASER): منظورازخریدار"شرکت ملی گازایران"ویاشرکتهای فرعی وابسته میباشد.

۴- "SHALL" : درمواردی بکاربرده میشودکه انجام خواسته موردنظراجباری است

۵- "SHOULD" : درمواردی بکاربرده میشودکه انجام خواسته موردنظرترجیحی و درعین حال اختیاری است

۶- "MAY" : درمواردی بکاربرده میشودکه انجام کاربه شکل موردبحث نیز قابل قبول میباشد

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*آدرس پایگاه اینترنتی(http://igs.nigc.ir) ، آدرس الکترونیکی(nigcigs@nigc.ir)

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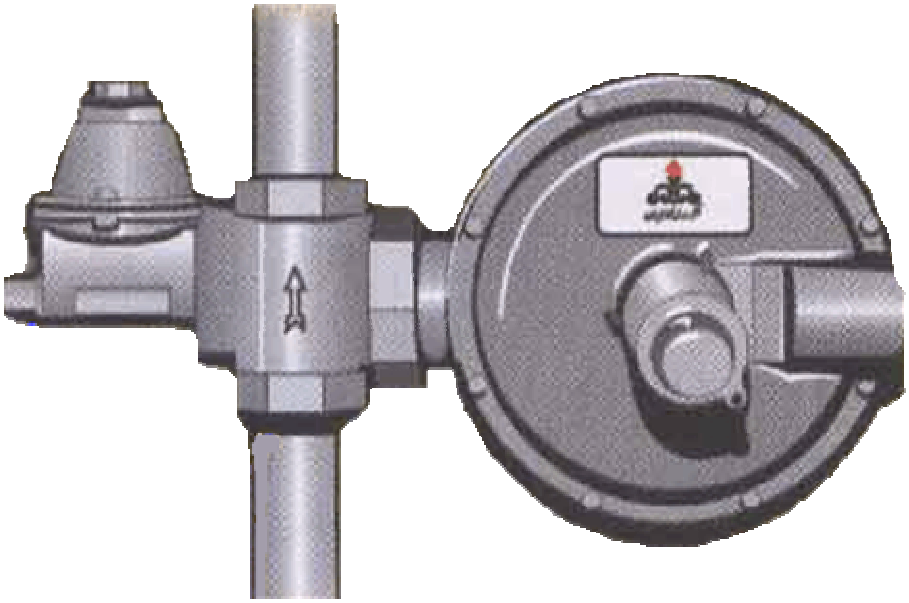
GAS PRESSURE REGULATORS , DOMESTIC



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1. SCOPE

THIS SPECIFICATION COVERS THE MINIMUM DESIGN . MATERIAL FABRICATION . TESTING . MARKING AND PACKING REQUIREMENTS OF DOMESTIC & COMMERCIAL GAS PRESSURE REGULATORS WITH INLET PRESSURE 1.03 – 4.14 BAR (15 – 60 PAIG) . OUTLET PRESSURE RANGE 15 – 23.7 MBAR (6 – 9.5 IN.W.C) . SIZES ¾ TO 1½ INCHES AND CAPACITIES FROM 2.5 TO 160 SCM/H. FOR SPECIFIC REQUIREMENTS SEE APPENDIX "B" .

IN CASE OF ANY EXCEPTION TO THIS SPECIFICATION . IT SHALL BE CLEARLY STATED ON THE TECHNICAL QUOTATION SUBMITTED BY SUPPLIER .

2. GENERAL REQUIREMENTS

SUPPLIER IS REQUIRED TO FILL COMPLETELY AND SIGN THE ATTACHED DATA SHEET AND SUBMIT SAMPLES IN QUANTITIES NEEDED FOR EACH REGULATOR AGAINST EACH INDIVIDUAL ITEM OF INQUIRY IN THE PROCESS OF TECHNICAL EVALUATION AS WELL AS 2 SETS OF THE FOLLOWING DOCUMENTATION IN ENGLISH WITH TECHNICAL QUOTATIONS .

2.1 ALL TECHNICAL INFORMATION SUCH AS MATERIAL SPECIFICATIONS AND STANDARDS , REGULATOR PERFORMANCE DATA AND ORIGINAL PRINTED CATALOGUE (S) .

2.2 COMPLETE PARTS LIST CATALOGUE (S) .

2.3 GENERAL DRAWING (S) SHOWING OUTLINE DIMENSIONS .

2.4 MANUALS FOR INSTALLATION , COMMISSIONING , OPERATION AND MAINTENANCE .

NOTE : IN CASE OF ORDER PLACEMENT , THE SUPPLIER SHALL SUBMIT 10 SETS OF ABOVE INFORMATION (ITEMS 21

TO 2.4) FOR EACH 5000 NUMBERS OF REGULATORS (MINIMUM 10 SETS) .

3. DESIGN & SERVICE CONDITIONS :

THE REGULATOR SHALL HAVE EASY MOVING PARTS WITHOUT STRESSES AND BE CONSTRUCTED OF QUALITY MATERIALS IN A WORKMANLIKE MANNER IN ORDER TO ATTAIN GAS TIGHTNESS , STABILITY OF PERFORMANCE AND SUSTAINED ACCURATE REGULATION OVER A PERIOD OF TIME AND OVER THE RANGE OF OPERATING CONDITIONS WITH MINIMUM OF MAINTENANCE , WHEN REGULATING NATURAL GAS SUCH REGULATOR SHALL HAVE THE GENERAL CHARACTERISTICS LISTED BELOW :

3.1- THE REGULATOR SHALL BE FOR OUTDOOR INSTALLATION AND ALL ITS PARTS SHALL BE RESISTANT TO ATMOSPHERIC CORROSION AS WELL AS THE CONTINUOUS ATTACK OF ODORIZED NATURAL GAS & METHANOL .

3.2- THE INLET PRESSURE 1.03 – 4.14 BAR (15 – 60 PSIG) , OUTLET PRESSURE RANGE 15 – 23.7 MBAR (6-9.5 IN.W.C) SET AT 17.5 ± 0.7 MBAR (7 ± 0.3 IN.W.C) AT A FLOW RATE AS PER APPENDIX " A " .

3.3- THE AMBIENT TEMPERATURE RANGE FOR THE REGULATOR -29 TO 60 DEG.C (-20 TO 140 DEG.F) .

3.4- STANDARD VOLUME MEASURED AT 1.013 BAR (14.696 PSIA) AND 15.6 DEG.C (60 DEG.F) .

3.5- REGULATOR PERFORMANCE SHALL COMPLY WITH THE FOLLOWING :

REGULATOR OUTLET PRESSURE SET AT 17.5± 0.7 MBAR (7± 0.3 IN.W.C) AT THE SPECIFIED FLOW RATE ACC. TO APPENDIX " A" AND 1.03 BAR (15PSIG) INLET PRESSURE .

THE OUTLET PRESSURE OF REGULATOR SHALL NOT RISE ABOVE 23.7 MBAR (9.5 IN.W.C) OR FALL BELOW 15 MBAR (6 IN.W.C) WITH FLOW VARIATION BETWEEN ZERO AND FULL

CAPACITY OF REGULATOR AT 1.03 AND 4.2 BAR (15 AND 60 PSIG) INLET PRESSURES .

3.6 THE REGULATOR SHALL BE EQUIPPED WITH LOW PRESSURE SHUT OFF DEVICE (L.P.S.O) , HIGH PRESSURE SHUT OFF DEVICE (H.P.S.O) & FULL CAPACITY INTERNAL RELIEF VALVE (F.I.R.V) . THE THREE SAFETY DEVICES AND THE REGULATOR ITSELF SHALL BE ASSEMBLED TOGETHER AND COMPRISE ONE UNIT ONLY .

3.7 THE SETTING OF THE HIGH PRESSURE SHUT OFF DEVICE (H.P.S.O) AND FULL CAPACITY INTERNAL RELIEF VALVE (F.I.R.V) SHALL BE ADJUSTABLE AND THEIR ADJUSTMENTS SHALL BE READILY ACCESSIBLE FOR EASE OF ADJUSTMENT . HIGH PRESSURE SHUT OFF DEVICE (H.P.S.O) SHALL BE INDEPENDENT OF THE MAIN DIAPHRAGM CASE AND VALVE SEAT OF THE REGULATOR .

BOTH HIGH & LOW PRESSURE DEVICES SHALL BE RESETABLE MANUALLY . THE LOW PRESSURE SHUT OFF DEVICE (L.P.S.O) SHALL NOT COME AUTOMATICALLY INTO THE SERVICE WHEN THE OUTLET PRESSURE REACHES BELOW 25 MBAR (10 IN.W.C) .

3.8 THE SETTING RANGES OF THE THREE SAFETY DEVICES OF THE REGULATOR SHALL BE AS FOLLOWING :

3.8.1- LOW PRESSURE SHUT OFF (L.P.S.O) SETTING 8.7± 1.2 MBAR (3.5± 0.5 IN.W.C) .

3.8.2- HIGH PRESSURE SHUT OFF (H.P.S.O) SETTING 42.3± 2.5 MBAR (17± 1 IN.W.C) .

3.8.3- FULL INTERNAL RELIEF VALVE (F.I.R.V) SETTING 62.3± 7.5 MBAR (25 ± 3 IN.W.C) .

3.9 FULL INTERNAL RELIEF VALVE (F.I.R.V) SHALL BE DESIGNED IN SUCH AWAY THAT IN CASE OF FAILURE OF ANY INTERNAL PARTS OF REGULATOR , IT SHALL BE ABLE TO DISCHARGE

THROUGH FLOW AT 4.2 BAR (60 PSIG) INLET PRESSURE WITHOUT INCREASING OUTLET PRESSURE OF REGULATOR ABOVE 106 MBAR .

3.10 THE INLET AND OUTLET CONNECTIONS OF REGULATOR SHALL BE IN-LINE . DIRECTION OF FLOW SHALL BE PERMANENTLY EMBOSSED ON THE VALVE BODY .

3.11 ALL INLET , OUTLET AND VENT CONNECTIONS SHALL BE THREADED N.P.T , FEMALE ACC. TO ANDI B 1.20.1 .

3.12 VENT SHALL BE LOCATED ON THE TOP COVER OF THE DIAPHRAGM CASE AT FARTHEST POINT WITH RESPECT TO THE VALVE BODY AND EMBOSSED " VENT " PERMANENTLY . VENT SIZE SHALL BE ETTHER ½ , ¾ , 1 , 1½ OR 2 INCH AND SUITABLE FOR RELIEVING FULL FLOW OF REGULATOR VENT SHALL BE PROVIDED WITH A SECURED REPLACEABLE BUG SCREEN .

3.13 THE VALVE LINKAGE SHALL BE SOLID TYPE , PIVOT PINS OR RIVETS SO DESIGNED THAT THEY CAN NOT WORKLOOSE IN THE ASSEMBLED REGULATOR .

3.14 THE VALVE ORIFICE SHALL NOT BE VARIABLE TYPE , THE VALVE ORIFICE THREAD SHALL BE GAS TIGHT AND ORIFICE SHALL BE ACCESSIBLE BY REMOVING DIAPHRAGM CASE FROM BODY AND SHALL BE EASILY REMOVABLE WITHOUT REQUIRED SPECIAL TOOLS .

3.15 THE VALVE DISC SHALL BE SO MOUNTED SUCH THAT IT WILL ALIGN FOR COMPLETE CONTACT WITH THE SEATING SURFACE OF THE VALVE ORIFICE THE VALVE DISC SHALL BE SECURELY FASTENED TO ITS ACTUATOR SO THAT IT CAN NOT BECOME SEPARATED DURING SHIPPING , HANDLING OR OPERATION .

3.16 DIAPHRAGM CASING SHALL BE CONSTRUCTED SUCH AS TO ALLOW 0 TO 180 DEGREE ROTATION WITH RESPECT TO THE VALVE BODY .

3.17 IN CASE THREADED PLASTIC PARTS ARE USED FOR THE REGULATOR . THEY SHALL BE CONSTRUCTED BY INJECTION AND THE THREAD SHALL BE PROVIDED ON ,MOULDS .

4. MATERIAL

4.1- VALVE BODY MATERIAL AND CONSTRUCTION SHALL BE CAST IRON ACC. TO ANSI B16.4 CLASS 125 .

4.2- DIAPHRAGM CASES MATERIAL SHALL BE DIE CAST ALUMINIUM ACC. TO ASTM B 85 . DIAPHRAGM CASE SHALL BE STRONG ENOUGH TO WITHSTAND 750 MBAR (11 PSIG) AIR PRESSURE WITHOUT ANY FAILURE .

4.3- DIAPHRAGM SHALL BE MADE OF REINFORCED SYNTHETIC MATERIAL DIAPHRAGM AND OTHER RUBBER PARTS MATERIAL OF REGULATOR (SUCH AS " O " RING , VLAVE DISC SEAT , ...) , SHALL BE HOMOGENOUS , FREE FROM POROSITY , GRIT , BLISTERS AND DEFECTS . TEST REQUIREMENTS SHALL BE ACC. TO TEST NO 8.12 OF INSPECTION & TESTS SECTION .

4.4- THE FOLLOWING INFORMATION SHALL BE PERMANENTLY MARKED ON THE MOULDED DIAPHRAGM OR MASTER SHEET OF DIAPHRAGM :

- THE MANUFACTURER NAME OR TRADE MARK .
- BATCH NUMBER .
- DATE OF MANUFACTURE

4.5 THE SPRINGS , STEMS , VALVE LINKAGE AND VENT SCREEN SHALL BE DURABLY CONSTRUCTED OF A CORROSION RESISTANT MATERIAL WITH STAINLESS STEEL OR CORROSION RESISTANT PLATED STEEL TO MEET THE REQUIREMENT OF SALT SPRAY TEST (TEST NO.8.13) .

4.6 ORIFICE SHALL BE MADE OF BRASS ACC. TO ASTM B16 OR STAINLESS STEEL TYPE 316.

THE VALVE ORIFICE THREAD SHALL BE GAS TIGHT . IF A THREAD SEALANT IS USED IT SHALL BE PERMANENT AND OF THE NONDRYING TYPE .

THE REGULATOR SHALL WITHSTAND HEATING TO 121 DEG.C (250 DEG.F) WITHOUT AFFECTING THE GAS TIGHTNESS OF ANY THREAD SEALANT USED .

4.7 SCREWS (EXCEPT THE ADJUSTING SCREWS) , BOLTS AND NUTS SHALL BE STAINLESS STEEL OR CORROSION RESISTANT PLATED STEEL TO MEET THE REQUIREMENT OF SALT SPRAY TEST (TEST NO.8.13) AND THREADING SHALL CONFORM TO ANSI B1.1 .

4.8 ALL ADJUSTING SCREWS , CAPS , DIAPHRAGM PLATE , VALVE DISC AND RELIEF VALVE CUP SHALL BE MADE OF SUITABLE MATERIAL TO WITHSTAND ANY MECHANICAL , CHEMICAL AND THERMAL ADVERSE CONDITIONS AS FOLLOWING TO WHICH THEY MAY BE SUBJECTED DURING SERVICES :

4.8.1- FULL OPENING & CLOSING FOR 100 TIMES (FOR ADJUXTING SCREWS AND CAPS) .

4.8.2- LOW AND HIGH TEMPERATURE -29 DEG.C AND 100 DEG.C (-20 DEG.F AND 212 DEG.F) FOR 24 HOURS .

4.8.3- ODORIZED NATURAL GAS .

5. PAINTING

THE REGULATOR BODY SHALL BE PROPERLY SURFACE PREPARED AND CLEANED TO ALLOW SUBSEQUENT TREATMENT AND UNIFORM PAINTING . ALUMINIUM CASING OF REGULATOR THAT COULD BE EXPOSED TO THE ATMOSPHERE SHALL RECEIVE A CHROMATE CONVERSION COATING .

THE EXTERIOR SURFACE OF THE REGULATOR SHALL HAVE AN ENAMEL COATING AND PAINTING WITH A DRY THICKNESS OF 50+10 MIC. FINAL COLOUR SHALL BE GREY ACC. TO ANSI Z55.1 , COLOUR NO.49 (OR EQUIVALENT) . TEST REQUIREMENTS FOR PAINTING SHALL BE IN ACC. WITH PAINT TEST (TEST NO.8.14) .

6. MARKING

EACH REGULATOR SHALL BEAR ON ITS BODY OR ON NAME PLATE (S) PERMANENTLY ATTACHED / AFFIXED ON TO THE FOLLOWING INFORMATION IN FARSI OR ENGLISH .

6.1- MANUFACTURER'S NAME OR TRADE MARD.

6.2- MANUFACTURER'S SERIAL NO., TYPE AND MODEL NO.

6.3- N.I.G.C P/O NO.

6.4- YEAR OF MANUFACTURE

6.5- REGULATOR CAPACITY IN SCM/H (AS PER APPENDIX " A ") .

6.6- INLET & OUTLET PRESSURE RANGE .

6.7- INLET , OUTLET AND VENT SIZES .

6.8- ORIFICE SIZE

6.9- NIGC INDICATION EMBOSSED ON THE VALVE BODY .

THE ADHESIVE QUALITY AND LEGIBILITY OF MARKING MATERIALS SHALL NOT BE ADVERSELY AFFECTED WHEN MARKING MATERIALS ARE EXPOSED TO HEAT , SUNLIGHT AND MOISTURE AS SPECIFIED IN ADHESION AND LEGIBILITY TEST OF MARKING (TEST NO.8.15) .

7. PACKING

7.1- EACH INDIVICUAL REGULATOR SHALL BE CLOSED IN A PLASTIC BAG WITH ALL OPENNINGS (SUCH AS INLET , OUTLET AND VENT) PLUGGED BY PLASTIC CAPS .

7.2- EACH PLASTIC BAG SHALL BE HOUSED IN A CARDBOARD BOX ,.

7.3- THE CARDBOARD BOXES SHALL BE HOUSED IN WOODEN CASES OF APPROPRIATE SIZE AND WITH PROVISIONS FOR LIFTING BY FORK AS PER THE REQUIREMENT OF NIGC ORDER .

8. INSPECTION AND TESTS

THE COMPLETE ASSEMBLED REGULATOR SHALL BE INSPECTED AND THE INSPECTION SHALL COVER THE FOLLOWING STAGES AS SPECIFIED IN THIS SPECIFICATION AND ACCORDING TO TERMS AND CONDITIONS OF PURCHASE ORDER AND MANUFACTURER'S DRAWING .

APPROXIMATELY 3% OF EACH ITEM AND LOT READY FOR PRESENTATION (UNLESS OTHER WISE SPECIFIED BY MUTUALLY AGREED INSPECTION PROCEDURE BASE ON CAPACITY AND QUANTITY OF EACH LOT) SHALL BE SELECTED RANDOMLY BY IDENTIFIED NIGC INSPECTOR .

MANUFACTURER SHALL PROVIDE AND PRESENT TO NIGC INSPECTOR TEST RESULTS FOR DIFFERENT EXAMINATIONS AND MATERIAL TEST CERTIFICATES ACCORDING TO REQUIREMENTS OF NIGC SPECIFICATION .

8.1- VISUAL INSPECTION

VISUAL INSPECTION INCLUDING CHECKING OF COLOUR THREAD NAMEPLATE , INTERNAL PARTS , NO APPARENT OR IMPERFECTION SHALL BE OBSERVED .

8.2- DIMENSIONS CHECKS

OVERAL DIMENSIONS SHALL BE CHECKED FOR RANDOMLY SELECTED SAMPLES .

8.3- ADJUSTMENT TESTS AND SAFETY DEVICES (AT 21± 1 DEG.C ROOM TEMP .)

8.3.1- WITH INLET PRESSURE OF 1.03 BAR (15 PSIG) AND FLOW AS SPECIFIED PER APPENDIX " A " ON EACH REGULATOR , THE OUTLET PRESSURE SHOULD BE 17.5± 0.7 MABAR (7± 0,3 IN.W.C) .

8.3.2- **WHEN THE REGULATOR IS SET AS ABOVE THE HIGH PRESSURE SHUT OFF DEVICE (H.P.S.O) SHOULD ACT WHEN OUTLET PRESSURE REACHES 42.3± 2.5 MBAR (17± 1 IN .W.C) AT BOTH 1.03 BAR (15 PSIG) AND 4.2 BAR (60 PSIG) INLET PRESSURES . THE MANUALLY RESETTING OF THIS DEVICE SHALL BE CHECKED .**

8.3.3- **WHEN THE REGULATOR OUTLET IS SUBJECTED TO 62.3± 7.5 MBAR (25± 3 IN.W.C) , THE FULL INTERNAL RELEIEF VALVE SHOULD ACT BOTH AT 1.03 BAR (15 PSIG) AND 4.2 BAR (60 PSIG) INLET PRESSURES . AT FULL FLOW CONDITION WITH 4.2 BAR (60 PSIG) INLET PRESSURE (AS DESCRIBED IN 3.9) , THE OUTLET PRESSURE SHALL NOT INCREASE ABOVE 106 MBAR (1.5 PSIG) .**

8.3.4- **AT THE SAME CONDITION AS PART 8.3.1 THE LOW PRESSURE SHUT OFF DEVICE (L.P.S.O.) SHOULD ACT WHEN OUTLET PRESSURE IS DROPT BELOW 8.7± 1.2 MBAR (3.5± 0.5 IN.W.C) AT EACH OF THE FOLLOWING CONDITIONS :**

1 - WHILE CLOSING THE INLET VALVE .

2 - WHILE INCREASING FLOW WITH INLET PRESSURES 1.03 AND 4.2 BAR (15 AND 60 PSIG) .
MANUALLY RESETTING OF THIS SYSTEM SHALL BE CHECKED .
AUTOMATIC RESETTING OF THIS SYSTEM SHALL BE CHECKED AS PER PARAGRAPH 3.7 PAGE 4 .

8.4 PERFORMANCE TEST (AT 21± 1 DEG.C ROOM TEMP .)

8.4.1- **LOCK – UP TEST : AFTER SETTING THE REGULATOR ACCORDING TO ADJUSTMENT TEST AND PASSING THE FLOW AS SPECIFIED PER APPENDIX "A" THROUGH EACH**

REGULATOR AT INLET PRESSURE OF 1.03 BAR (15 PSIG) , THE OUTLET OF THE VALVE IS CLOSED (Q = 0) , AFTER 2 MINUTES THE OUTLET PRESSURE (LOCK – UP PRESSURE) SHALL NOT EXCEED 23.7 MBAR (9.5 IN.W.C.) .

8.4.2- PERFORMANCE CURVE : WITH INLET PRESSURE OF 1.03 BAR (15 PSIG) THE OUTLET PRESSURE OF REGULATOR SHALL BE RECORDED FOR 10 , 20 , 30 , 40 , 50 , 60 , 70 , 80 , 90 , AND 100 PERCENT OF REGULATOR CAPACITY . THE PERFORMANCE CURVE THUS OBTAINED SHALL SHOW THE SUTTABILITY OPERATION OF REGULATOR WITHIN THE MENTIONED LIMITS IN THIS STANDARD .

8.4.3- DROOP TEST : WITH INLET PRESSURE OF 1.03 BAR (15 PSIG) . THE OUTLET OF THE VALVE SHALL BE OPENED UNTIL THE PASSING FLOW FROM REGULATOR EQUAL THE MAXIMUM CAPACITY . AT THIS TIME THE OUTLET PRESSURE SHALL NOT DROPT BELOW 15 MBAR (6 IN.W.C) .

8.4.4- TESTS AS 8.4.1 , 8.4.2 AND 8.4.3 SHALL BE PERFORMED WITH 4.2 BAR (60 PSIG) INLET PRESSURE . THE RESULTS SHALL BE THE SAME AS OUTLINED IN THE SET PARAGRAPH .

8.5- OUTLET PRESSURE RANGE TEST

THE REGULATOR SAMPLE SHALL BE TESTED FOR OUTLET PRESSURE RANGE BETWEEN 15 TO 23.7 MBAR (6-9.5 IN.W.C) WHEN THE INLET PRESSURE APPLIED IS 1.03 BAR (15 PSIG) AND THE FLOW RATES AS SPECIFIED PER APP ." A " .

8.6- TIGHTNESS TEST

SAMPLES SHALL BE TESTED FOR TIGHTNESS WHEN WITH CLOSED VENT PORT APPLYING 4.2 BAR (60 PSIG) PRESSURE TO

THE INLET AND 138 MBAR (2 PSIG) TO THE OUTLET . NO LEAKAGE SHALL BE WITNESSED .

8.7- AMBIENT TEMPERATURE TEST

8.7.1- REGULATOR SHALL BE KEPT IN 60 DEG.C (140 DEG.F) ENVIRONMENT FOR APP. 12 HOURS . AT THIS TEMPERATURE , THE REGULATOR SHALL BE TESTED IN ACCORDANCE WITH PARAGRAPHS 8.3.2 , 8.3.3 , 8.3.4 , 8.4.1 , 8.4.3 WITH INLET PRESSURE 1.03 AND 4.2 BAR (15 AND 60 PSIG) AND THE TESTS RESULTS SHALL STAY WITHIN LIMITS SPECIFIED IN THIS STANDARD . MEANWHILE THE REGULATOR SHALL OPERATE WITHOUT OBJECTIONABLE NOISE , MALFUNCTION , PULSATION OR CHATTERING . THEN THE REGULATOR SHALL BE PUT IN ROOM TEMPERATURE FOR ABOUT 30 MINUTES AND IT SHALL BE TESTED IN ACCORDANCE WITH PARAGRAPH 8.6 (TIGHTNESS TEST) .

8.7.2- SAME AS ABOVE BUT AT TEMPERATURE -29 DEG.C (-20 DEG.F) .

8.8- LIFE TEST

WITH INLET PRESSURE OF 4.2 BAR (60 PSIG) AND MAXIMUM CAPACITY OF REGULATOR , THE OUTLET OF REGULATOR SHALL BE OPENED AND CLOSED 100,000 TIMES AT CYCLE OF 10 OPERATION PER MINUTES . THEN THE REGULATOR SHALL BE TESTED FOR PERFORMANCE AND TIGHTNESS TESTS (TESTS NO.8.4 AND 8.6) , THE RESULTS SHALL BE ACCEPTABLE .

8.9- VALVE BODY PRESSURE RATING TEST

BY CLOSING THE PORTS OF REGULATOR VALVE BODY SAMPLE WHILE APPLYING 12BAR (175 PSIG) HYDROSTATIC PRESSURE VIA INLET / OUTLET PORT FOR 2 HOURS , IT SHALL WITHSTAND THE PRESSURE .NO LEAKAGE FALLURE OR CRAKS SHALL BE WITNESSED .

8.10- TWIST TEST

FOR CAST IRON BODY OF REGULATOR , THE TWIST TEST SHALL BE APPLIED ACC.TO ANSI B16.33 SECTION 3.4.2 .

8.11- LOAD TEST

REGULATOR , INSTALLED WITH DIAPHRAGM HOUSING IN HORIZONTAL POSTION , SHALL WITHSTAND A CANTILEVERED LOAD OF AT LEAST 115KG APPLIED AT THE EDGE FARTHEST FROM THE CONNECTIONS , WITHOUT AFFECTING PERFORMANCE , OR CAUSING LEAKAGE , FRACTURE OR PERMANENT DEFORMATION OF ANY COMPONENT .

8.12- DIAPHRAGMS AND OTHER RUBBER PARTS CHECKS AND TEST

8.12.1- DIAPHRAGMS

8.12.1.1- DIAPHRAGM CHECKING : DIAPHRAGM MATERIAL SHALL BE CHECKED AS PARAGRAPH 4-3 OF MATERIAL SECTION . THE THICKNESS VARIATION OF DIAPHRAGM ON THE SAME SECTIONS SHALL BE ±10% .

8.12.1.2- IDENTIFICATION : IDENTIFICATION CHECKING SHALL BE CARRIED OUT AS PARAGRAPH 4.4.

8.12.1.3- TESTS ON DIAPHRAGM MATERIAL :

NOTE : **TEST PIECES : TEST PIECES SHALL BE TAKEN FROM A DIAPHRAGM OR FROM THE DIAPHRAGM MATERIAL , IF FROM THE LATER THEY SHALL BE OF THE SAME THICKNESS AND CURED UNDER THE SAME CONDITIONS AS THE DIAPHRAGM .**

8.12.1.3.1- HYDROCARBON MIXTURE TEST : WHEN A TEST PIECE IS IMMERSED AND ALLOWED TO SWELL FREELY IN A MIXTURE OF TOLUENE AND HEPTANE IN THE PROPORTION 1:1 BY VOLUME AT 20 ± 5°C FOR 7 DAYS , THE CHANGE IN AREA SHALL NOT BE GREATER THAN 5% OF THE ORIGINAL AREA .

AFTER IMMERSION AND DRYING TO CONSTANT MASS AT ROOM TEMPERATURE . THE EXTRACTED MATERIAL SHALL NOT EXCEED 12% BY MASS OF THE ORIGINAL MASS OF THE TEST PIECE , AND TE AREA SHALL NOT DIFFER FROM THE ORIGINAL AREA BY MORE THAN 5% . THE MATERIAL SHALL NOT SHOW ANY SIGN OF DELAMINATION OR BLISTERING .

NOTE : **THE VOLUME RATIO OF LIQUID TO TEST PIECE SHALL NOT BE LESS THAN 50:1 .**

8.12.1.3.2- WATER TEST : WHEN THE TEST PIECE IS IMMERSED IN DISTILLED OR DEIONEZED WATER AND ALLOWED TO SWELL FREELY AT 20± 5° C FOR 7 DAYS , THE CHANGE IN AREA OF THE MATERIAL SHALL NOT BE GREATER THAN 5% OF THE ORIGINAL AREA OF THE TEST PIECE .

AFTER IMMERSION AND DRYING TO CONSTANT MASS IN AIR AT ROOM TEMPERATURE , THE EXTRACTED MATERIAL SHALL NOT EXCEED 12% BY MASS OF THE ORIGINAL MASS OF THE TEST PIECE AND THE AREA SHALL NOT DIFFER FROM THE ORIGINAL AREA BY MORE THAN 5% .

THE MATERIAL SHALL NOT SHOW ANY SIGN OF DELAMINATION OR BLISTERING .

8.12.1.4- **ACCELERATED AGEING TEST : THE STIFFNESS OF THE TEST PIECE SHALL BE MEASURED AT 20°± 5° C , BY TORSION APPARATUS (APP. " F " OF BS 4161 : PART 5 : 1990) THE STIFFNESS , WHEN REMEASURED AT 20 ± 5° C SHALL NOT HAVE INCREASED BY MORE THAN 25% AFTER THE TEST PIECE HAS BEEN SUBJECTED TO A TEMPERATURE OF 70 ± 2° C IN AN AIR – CIRCULATING OVEN FOR 4 WEEKS . IN ADDITION , THE TEST PIECE SHALL NOT SHOW ANY SIGN OF DELAMINATION , BLISTERING OR SIGNIFICANT DETERIORATION .**

8.12.1.5- **LOW TEMPERATURE FLEXIBILITY TEST : THE STIFFNESS OF THE TEST PIECE SHALL BE MEASURED AT 20 ± 5° C C BY TORSION APPARATUS (APP . " F " OF BS 4161 : PART 5 : 1990) THE STIFFNESS WHEN MEASURED AT -20 ± 1° C SHALL NOT HAVE INCREASED BY MORE THAN 25% AFTER THE TEST PIECE HAS BEEN SUBJECTED TO THIS**

TEMPERATURE IN AN ENVIRONMENTAL CHAMBER FOR 20 MIN .

8.12.1.6- DIAPHRAGM TIGHTNESS TEST : DIAPHRAGM TEST PIECE SHALL BE LOCATED BETWEEN THE TWO HALVES . AIR AT A PRESSURE OF 280 MBAR (4 PSIG) SHALL BE APPLIED TO THE UNDERSIDE OF IT . THEN INLET PRESSURE SHALL BE LOCKED OFF AND NO LEAKAGE SHALL BE OBSERVED BY CONTROLLING INLET PRESSURE .

8.12.2- OTHER RUBBER PARTS (VALVE SEATS , SEALS AND "O" RINGS)

8.12.2.1- GENERAL : THE TESTS SHALL BE CARRIED OUT WITH THE FINISHED COMPONENT OR WITH PARTS OF THE FINISHED COMPONENT .

THE ELASTOMERIC MATERIAL SHALL BE HOMOGENEOUS , FREE FROM POROSITY , INCLUSIONS , GRIT , BLISTERS AND SURFACE IMPERFECTIONS VISIBLE WITH THE NAKED EYE .

8.12.2.2- RESISTANCE TO LUBRICANT : THE TEST SHALL BE CARRIED OUT ACCORDING TO 8.2 OF ISO 1817 : 1985 CONCERNING THE GRAVIMETRIC METHOD BUT THE DURATION OF IMMERSION SHALL BE 168± 2° HOURS IN OIL NO.2 (ISO 1817 : 1985) AT THE 100± 2° C AMBIENT TEMPERATURE .

DETERMINE THE RELATIVE CHANGE OF MASS , ΔM , USING THE FOLLOWING FORMULA .

$$\Delta M = \frac{M3 - M1}{M1} \times 100$$

WHERE

M1 IS THE INITIAL MASS OF THE TEST PIECE IN AIR ,

M3 IS THE MASS OF THE TEST PIECE IN AIR AFTER IMMERSIION .

AFTER THIS TEST , THE CHANGE OF MASS SHALL BE BETWEEN -10% AND +10% .

THE TEST PIECE SHALL NOT SHOW ANY SIGN OF DELAMINATION , BLISTERING OR SIGNIFICANT DETERIORATION .

8.12.2.3- RESISTANCE TO GAS : THE TEST SHALL BE CARRIED OUT ACCORDING TO 8.2 OF ISO 1817 : 1985 CONCERNING THE GRAVIMETRIC METHOD AND CLAUSE 9 CONCERNING THE DETERMINATION OF EXTRACTED SOLUBLE MATTER , BUT UNDER THE FOLLOWING CONDITIONS :

A- THE DURATION OF IMMERSION SHALL BE 72± 2 HOURS AT 23± 2° C IN A PENTANE

(MINIMUM 98% BY MASS OF N-PENTANE , ESTIMATED BY GAS CHROMATOGRAPHY) .

2nd- DRY THE TEST PIECES FOR A PERIOD OF 168± 2 HOURS IN AN OVEN AT 40± 2° C AT ATMOSPHERIC PRESSURE .

3rd- DETERMINE THE RELATIVE CHANGE OF MASS ΔM , WITH REFERENCE TO THE INITIAL MASS OF THE TEST PIECE , USING THE FOLLOWING FORMULA :

$$\Delta M = \frac{M5 - M1}{M1} \times 100$$

WHERE

M1 IS THE INITIAL MA SS OF THE TEST PIECE IN AIR .

M5 IS THE MASS OF THE TEST PIECE IN AIR AFTER DRYING .

AFTER THIS TEST THE CHANGE OF MASS SHALL BE BETWEEN -15% AND +5% .

THE TEST PIECE SHALL NOT SHOW ANY SIGN OF DELAMINATION , BLISTERING OR SIGNIFICANT DETERIORATION .

8.12.2.4 THE ELASTOMER MATERIAL SHALL BE PLACED IN CHAMBER MAINTAINED AT -29 ± 1° C FOR 1 HOUR . AT THIS TEMPERATURE , THE TEST PIECE SHALL HAVE SUFFICIENT FLEXIBILITY FOR ITS SERVICES . THE TEST PIECE SHALL NOT SHOW ANY SIGN OF DELAMINATION , BLISTERING OR SIGNIFICANT DETERIORATION .

8.12.2.5- AFTER THE ELASTOMER MATERIAL HAS BEEN SUBJECTED TO A TEMPERATURE OF 70± 2° C IN AN AIR – CIRCULATING OVEN FOR 168± 2 HOURS THE TEST PIECE SHALL NOT SHOW ANY SIGN OF DELAMINATION , BLISTERING OR SIGNIFICANT DETERIORATION .

8.13- <u>SALT SPRAY TEST</u>

SALT SPRAY TEST IN ACCORDANCE WITH ASTM B117 FOR 500 HOURS SHALL BE CARRIED OUT FOR ALL CORRODIBLE METALLIC PARTS OF REGULATOR SUCH AS LEVERS , SPRINGS , PINS , NUT & BOLTS , ETC .

8.14- <u>PAINT TEST</u>

PAINTING OF REGULATOR SHALL BE CHECKED AS FOLLOWS :

8.14.1- THE COLOUR OF PAINT SHALL BE GREY ACCORDING TO REQUIREMENTS AS MENTIONED AT " PAINTING " SECTION (PAGE 8) .

8.14.2- THICKNESS : THE THICKNESS OF PAINT SHALL BE MEASURED AT FIVE POINTS ON EACH DIAPHRAGM REGULATOR CASING . NONE OF EACH INDIVIDUAL POINT SHALL BE LESS THAN 50 MICRONS AND DEFFERENCE BETWEEN MINIMUM AND MAXIMUM MEASURED VALUE SHALL NOT EXCEED 20% .

8.14.3- PAINT ADHESION : THE TEST SHALL BE DONE IN ACCORDANCE WITH BS 3900 PART E6 (1992) EQUIVALENT TO ISO 2409 (1992)

8.15- ADHESION AND LEGIBILITY TEST OF MARKING

THE FOLLOWING TESTS ACC. TO ANSI Z21.15 1992 SHALL BE CONDUCTED ON SAMPLES . THE MANUFACTURER SHALL HAVE APPLIED THE MARKING MATERIALS TO THE REGULATORS AS THEY WOULD BE APPLIED IN MASS PRODUCTION .

8.15.1- ADHESIVE TYPE MARKING MATERIALS SHALL EXHIBIT :

8.15.1.1- GOOD ADHESION AND NO CURLING AT EDGES .

8.15.1.2- NO ILLEGIBLE OR DEFACED PRINTING WHEN RUBBED WITH THUMB OR FINGER PRESSURE .

8.15.1.3- GOOD ADHESION WHEN A DULL METAL BLADE (AS THE BACK OF A POCKETKNIFE BLADE) IS HELD AT 90 DEGREES (1.57 RAD) TO THE APPLIED MARKING AND SCRAPED ACROSS THE EDGES OF THE MARKING .

8.15.2- NONADHESIVE TYPE MARKING MATERIALS SHALL EXHIBIT NO ILLEGIBLE OR DEFACED PRINTING WHEN RUBBED WITH THUMB OR FINGER PRESSURE .

8.15.3- THE MARKING MATERIALS SHALL THEN BE PLACED IN AN OVEN FOR A PERIOD OF 2 WEEKS WITH THE OVEN TEMPERATURE MAINTAINED AT +60° C . FOLLOWING THE OVEN TEST , ADHESION AND LEGIBILITY OF THE SAMPLES SHALL BE CHECKED AGAIN AS SPECIFIED IN 8.15.1 OR 8.15.2 ABOVE SAMPLES SHALL THEN BE IMMERSED IN WATER FOR A PERIOD OF 24 HOURS . AFTER WHICH ADHESION AND LEGIBILITY SHALL BE RECHECKED AS SPECIFIED IN 8.15.1 OR 8.15.2 ABOVE .

APPENDIX " A "
CAPACITIES & CONNECTIONS

ITEM	REGULATOR MAX. CAPACITY (SCMH) WITH AIR DENSITY OF 1.2 KG/M³	REGULATOR INLET X OUT NOMINAL DIA (IN.) FEMALE , NPT THREAD ACC.TO ANSI B1.20.1	FLOW RATE FOR ADJEXTMENT OF REGULATOR SET PRESSURE SCMH (SCFH)
1	2.5	¾ × ¾	1.5 (50)
2	4	¾ × ¾	1.5 (50)
3	6	¾ × 1	1.5 (50)
4	10	¾ × 1	1.5 (50)
5	16	¾ × 1	1.5 (50)
6	25	¾ × 1	1.5 (50)
7	40	11/2 × 11/2	6 (200)
8	65	11/2 × 11/2	6 (200)
9	100	11/2 × 11/2	6 (200)
10	160	11/2 × 11/2	10 (330)

APPENDIX " B"
DATA SHEET (1)

TO BE FILLED IN BY NIGC	TO BE FILLED IN BY SUPPLIER
INQUIRY NO. :	QUOTATION NO. :
INQUIRY DATE :	QUOTATION DATE :
NIGC STANDARD : IGS-MS-IN-201(2) : 1999	CATALOGUE NO. :

INQUIRY DATA				OFFERED DATA		
ITEM	INDENT ITEM NO.	MAX. CAPACITY (SCMH)	QUANTITY REQUIRED	MAX. CAPACITY (SCMH)	QUANTITY OFFERED	TYPE-MODLE

(1) : THIS DATA SHEET IS AN INTEGRATED PART OF STD.NO.IGS – MS – IN – 201 (2) : 1999 AND SHOULD NOT BE USED SEPARATELY .

APPENDIX " B " (CONTINUED
DATA SHEET

TO BE FILLED BY SUPPLIER	REQUIRED BY NIGC	DATA	
…….BAR (…….PSIG)	1.03-4.2 BAR (15.06 PSIG)	GAS INLET PRESSURE	
…….MBAR (……. IN.W.C)	17.5±0.7 MBAR (7±0.3 IN.W.C)	SET POINT OF REGULATOR WITH FLOW RATE ACC.TO APP ″ A″	SERVICE & DESIGN CONDITION CONNECTION
……MBAR (……IN.W.C)	MIN.15 MBAR (MIN.6 IN.W.C.)	OUTLET PRESSURE AT MAX CAPACITY AND MININLET PRESSURE 1.03 BAR (15 SIG)	
……..MBAR (…….IN.W.C)	23.7 MBAR (9.5 IN.W.C)	MAXLOCK-UP PRESSURE WITH INLET PRESSURE 4.2 BAR (60 PSIG)	

YES NO	8.7±1.2 MBAR (3.5±0.5 IN.W.C)	LOW PRESSURE SHUT OFF DEVICE (L.P.S.O) SETTING	
YES NO	42.3±2.5 MBAR (17±1 IN.W.C)	HIGH PRESSURE SHUT OFF DEVICE (H.P.S.O) SETTING	
YES NO	62.3±7.5 MBAR (25±3 IN.W.C)	FULL INTERNAL RELIEF VALVE (F.I.R.V) SETTING	
YES NO	ACC.TO APP. "A"	INLET/OUTLET SIZE AND THREAD STD.OF CONNECTION	
.....TO .....DEG.C	-29 TO 60 DEG.C.	AMBIENT TEMPERATURE RANGE	
YES NO	ACC. TO MATERIAL SECTION (SECTION 4)	STD FOR MATERIAL OF BODY/DIAPHRAGM CASING /ORIFICE/DIAPHRAGM & SEATS / SCREWS / NUT & BOLTS AND ETC.	

APPENDIX " B"
DATA SHEET

	DATA	REQURED BY NIGC	TO BE FILLED IN BY SUPPLIER
	GUARANTEE	24 MONTHS AFTER SHIPMENT OR 1 YEAR AFTER PUTTING IN SERVICE WHICHEVER COMES EARLIER	YES NO.
	MANUFACTURER SIGNATURE AND STAMP		

APPENDIX " C "
REFERENCES

THROUGHOUT THIS STANDARD SPECIFICATION THE FOLLOWING STANDARDS AND CODES ARE REFERRED TO THE EDITIONS OF THESE STANDARDS AND CODES THAT ARE IN EFFECT AT THE TIME OF PUBLICATION OF THIS STANDARD SPECIFICATION (1999) SHALL , TO THE EXTENT SPECIFIED HEREIN , FORM A PART OF THIS STANDARD SPECIFICATION . THE APPLICABILITY OF CHANGES IN STANDARDS AND CODED THAT OCCUR AFTER THE DATE OF THIS STANDARD SPECIFICATION

SHALL BE MUTUALLY AGREED UPON BY THE PURCHASER AND SUPPLIER AND / OR MANUFACTURER .

1. **ASTM B85 – 1981 STANDARD SPECIFICATION FOR ALUMINIUM ALLOY DIE CASTINGS .**

2. **ASTM B117 – 1985 STANDARD METHOD OF SALT SPRAY (FOG) TESTING .**

3. **ASTM B16 – 1985 STANDARD SPECIFICATION FOR FREE – CUTTING BRASS ROD , BAR , AND SHAPES FOR USE IN SCREW MACHINES .**

4. **ANSI B1.20.1 – 1983 PIPE THREADS , GENERAL PURPOSE**
5. **ANSI B1.1 UNIFIED INCH SCREW THREADS**
6. **ANSI Z 21.15-1992 MANUALLY OPERATED GAS VALVES FOR APPLIANCES & APPLIANCES CONNECTOR VALVES & HOLES END VALVES .**
7. **ANSI B16.4 – 1977 CAST IRON THREADED FITTINGS CLAS 125 AND 250**
8. **ANSI B16.33 – 1981 MANUALLY OPERATED METALLIC GAS VALVES FOR USE IN GAS PIPING SYSTEM UPTO 125 PSIG**
9. **BS 3900 : PART E6 : 1992 METHODS OF TEST FOR PAINTS CROSS – CUT TEST .**
10. **BS 4161 : PART 5 : 1990 SPECIFICATION FOR DIAPHRAGM METERS FOR WORKING PRESSURES UP TO 7 BAR .**
11. **BS – EN 549 : 1995 RUBBER MATERIALS FOR SEALS AND DIAPHRAGMS FOR GAS APPLIANCES AND GAS EQUIPMENT .**
12. **ISO 1817 RUBBER VULCANIZED – DETERMINATION OF THE EFFECT OF LIQUIDS .**
13. **ISO 2409 : 1992 METHODS OF TEST FOR PAINTS AND VARNISHES .**
14. **AMERICAN GAS ASSACIATION FOR SERVICE REGULATOR SPECIFICATION .**